

REMARKS

The applicant respectfully requests reconsideration in view of the amendment and following remarks. Support for amended claim 1 can be found in the original claim 1.

The applicant appreciates that the Examiner has allowed claims 4-6.

Claims 1, 2, 7-9, and 12 remain rejected under 35 U.S.C. 103(a) over Mori et al., U.S. Patent No. 7,352,876 (Mori) in view of Tsapatsis US Patent No. 7,357,836 (Tsapatsis). The applicant respectfully traverses this rejection.

Mori discloses a laminated zeolithe composite and a method for production thereof. According to col. 2, lines 29 to 36, according to the invention of Mori, a laminated zeolithe composite is provided, characterized in that it comprises a MFI membrane, constituted by a MFI-type zeolithe having specific silica to alumina ratio, and a porous substrate constituted by a MFI-type zeolithe having another silica/alumina ratio. Therefore, Mori only teaches a laminated zeolithe composite membrane comprising zeolithes in both layers, in the substrate layer and in the membrane layer. This is further discussed at column 3, lines 47 to 55, wherein it is stated that since a MFI membrane is formed on a porous zeolithe substrate, and since the membrane is composed of the same zeolithe as the porous substrate, inconveniences such as crack generation in MFI membrane due to difference in thermal extension coefficient between the porous substrate and the MFI membrane are avoided during production or use of the composite and the MFI membrane in its function at a satisfactory level.

Mori therefore clearly teaches away from a composite membrane having different materials present in the substrate layer and in the membrane layer, as it is claimed in claim 1 of the present application, wherein a separation layer containing a zeolithe of the MFI-type is located on a substrate made of titanium oxide.

As the Examiner has recognized, Tsapatsis discloses crystalline membranes comprising for example a membrane of a framework material such as a zeolithe which is present on a substrate, wherein the substrate can be made of inorganic material such as metal, an alloy, a ceramic or a metal oxide (see column 7, lines 50 to 54 of Tsapatsis). The very general teaching of Tsapatsis is that metal oxides may be used as substrates. However, Tsapatsis does not disclose the very specific material, titanium oxide, which is claimed as the substrate of the composite membrane according to amended claim 1 of the present application.

The advantages of titanium oxide as the material of the substrate in a composite membrane according to the present application are discussed in the specification in the applicant's examples.

In membranes 1 and 2, the substrates used were different from titanium oxide. In membrane 1, titanium dioxide on alumina was used and in membrane 2, pure alumina was used as membrane. In contrast to this, in membrane 3 according to amended claim 1 of the present application titanium dioxide was used. The results which are obtained by these membranes in respect of purification of butene are shown in the table on page 16. Whereas membranes 1 and 2 give rise to 1-butene in the permeate in amounts of 79% or 85.6%, however the 2-butenes (which is not desirable) are present in high amounts of 2% or 0.4%. In addition, C₈-hydrocarbons (which is also not desirable) was present in the permeate in amounts of 0.5% or 0.1%. With membrane 3, according to amended claim 1 of the present application, the desired 1-butene can be obtained in an amount of 85%, whereas the undesirable 2-butenes are present in less than 0.1% and C₈-hydrocarbons are present in an amount of only 17.5 ppb.

The results presented in the table on page 16 of the description of the present application clearly show that titanium oxide has unexpectedly superior advantages compared to alumina or titanium oxide on alumina as substrates.

The use of titanium oxide as sole substrate material in a composite membrane which is claimed in amended claim 1 of the present application is, from applicant's point of view, non-obvious in respect of Mori et al. and Tsapatsis et al.

Mori only teaches that in composite membranes, the substrate layer and the membrane layer shall be made of the same material, in order to obtain advantages as mentioned above. Substrate layer and membrane layer according to Mori only differ in the silica to alumina ratio, which are 40 to 100 for the membrane layer and 20 to 400 for the substrate layer. This does not point in the direction of a very specific composite membrane comprising a substrate made of titanium oxide and a membrane layer consisting of a zeolithe of the MFI-type.

In addition, Tsapatsis discloses that crystalline membranes can be found on substrates made of a metal, an alloy, a ceramic or a metal oxide, see column 7, lines 50 to 54 of Tsapatsis. This does not point in the direction of the specific composite membrane according to amended claim 1 because titanium oxide is not mentioned and not suggested in Tsapatsis.

A statement that modifications of the prior art to meet the claimed invention would have been “obvious to one of ordinary skill in the art at the time the invention was made” because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993). See MPEP § 2143.01 IV. “[R]ejections on obviousness cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1396 (2007) quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006). Furthermore, the Examiner cannot selectively pick and choose from the disclosed parameters without proper motivation as to a particular selection. The mere fact that a reference may be modified to reflect features of the claimed invention does not make the modification, and hence the claimed invention, obvious unless the prior art suggested the desirability of such modification. *In re Mills*, 916 F.2d 680, 682, 16 USPQ2d 1430 (Fed. Cir. 1990); *In re Fritch*, 23 USPQ2d 1780 (Fed. Cir. 1992). Thus, it is impermissible to simply engage in a hindsight reconstruction of the claimed invention where the reference itself provides no teaching as to why the applicant’s combination would have been obvious. *In re Gorman*, 933 F.2d 982, 987, 18 USPQ2d 1885, 1888 (Fed. Cir. 1991).

A person having ordinary skill in the art and combining Mori and Tsapatsis would not find the teaching that the inventive combination of a zeolithe of the MFI-type in the separation layer and titanium oxide in the substrate layer give rise to the advantages in butenes-separation which is achieved by the applicant’s claimed invention (see the examples of the present application). For the above reasons, this rejection should be withdrawn.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 03-2775, under Order No. 13156-00063-US from which the undersigned is authorized to draw.

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Respectfully submitted,

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